

detection, thus a PET camera and not two modules of a Compton gamma camera: “to identify a coincidence event between the two detectors of a PET Gamma camera” (paragraph [0007]). Applicants contend that El-Hanay does not describe an enhanced Compton gamma camera (having sub-aperture resolution) as describe in the pending application (page 11, lines 9-23; p. 37, lines 3-23 and p. 38, lines 1-15). The interaction height (sub-aperture resolution) information is the same information that is provided by the interaction depth information (for a conventional face-on detector) that is determined electronically as the location between the anode and cathode sides of the detector plane (along the thickness of the detector plane). For a detector positioned edge-on this interaction depth information represents electronically-defined aperture height resolution (sub-aperture resolution). A 1-D edge-on detector (such as a strip detector) with interaction height (sub-aperture) resolution can function as a 2-D edge-on detector (it still lacks depth resolution). A single 2-D edge-on detector with interaction height (sub-aperture) resolution or a single 2-D face-on detector with interaction depth resolution both function as 3-D detectors. Applicants note that they describe the use of arrays of 1-D and 2-D strip detectors, 2-D arrays, segmented strip detectors, depth-of-interaction capability associated with edge-on 2-D arrays, and sub-aperture resolution capability for semiconductor and scintillation detector materials in Patent No. 6,583,420 B1 (column 5, lines 8-49) and Disclosure document No. 464163 (10-25-1999). The Applicants describe the use of communication links to transfer data between the detector modules and a computer in Patent No. 6,583,420 B1 (column 6, lines 47-67). The Applicants’ Patent No. 6,583,420 B1 and Disclosure document No. 464163 (10-25-1999) describe the edge-on detector configurations in El-Hanany’s application and much more. Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.

3. Response to item 3, Examiner’s objections to claims 2 as being disclosed by El-Hanany as prior art (Wainer et al.), which includes strip radiation detectors. Applicants note that El-Hanay (as well as Wainer) does not describe an enhanced Compton gamma camera since they do not describe electronically-determined sub-aperture resolution capability for edge-on detectors, including strip detectors. In Remark 2 the Applicants cited relevant passages in the pending application (p.11, lines 9-23; p. 37, lines 3-23 and p. 38, lines 1-15) as well as Patent No. 6,583,420 B1 (column 5, lines 8-49) and Disclosure document No. 464163 (10-25-1999) that address the issues of edge-on single and double-sided strip detectors, cross strip detectors, 2-D detectors, depth-of-interaction capability, and sub-aperture resolution capability for edge-on double-sided strip, cross strip, and 2-D detectors in response to Examiner’s rejection of claim 1. Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.
4. Response to item 3, Examiner’s objections to claim 3-4 in that El-Hanany discloses limitations set forth in claim 1, but El-Hanany does not specify that detectors and modules will have different properties. Examiner states that there will always be small variations within a detector and between detectors and thus this is obvious. Applicants note that they account for the small variations between detectors and

between detector modules in the pending application by calibration (tuning) (p.66, lines 17-21). Applicants describe the different properties of detectors and detector modules including energy resolution, spatial resolution, stopping power, and readout rates (p.19, lines 6-11). Applicants describe varying edge-on detector thickness, spatial resolution, and material (p. 45, lines 20-23 and p. 46, lines 1-11). Applicants note that the use of multiple detector materials within a detector module is described in Patent No. 6,583,420 B1 (column 6, lines 48-54; column 7, lines 49-61; column 8, lines 11-17). Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.

5. Response to item 3, Examiner's objections to claim 5 as being disclosed by El-Hanany as prior art that includes a dual-sided parallel strip detector (Figure 2). Applicants note that the prior art cited specifies that "each thin detector layer has an array of anode strips running the length of the detector surface" (paragraph [0009]), which is only a single-sided strip detector. This is confirmed by an examination of El-Hanany's Figure 2, which shows that each thin edge-on detector 52 uses multiple strip anodes 54. All the strip anodes in edge-on detector 52 share the same cathode. Applicants note that this is not the same as an edge-on dual-sided strip detector in which there is a corresponding (dedicated) cathode strip parallel to each anode strip. Determining (electronically) the sub-aperture position of an event between an anode strip and a dedicated cathode strip is less-problematic than the configuration wherein a single cathode is shared with all of the anode strips in the detector. The use of dedicated cathode and anode strips will provide lower readout noise (small versus large cathode area) and reduce the frequency of ambiguous detection events. (For example, consider two detection events occurring at approximately the same time and the two events are recorded by different anode strips. There is an ambiguity in determining which of the signals from the common cathode (assuming that the readout electronics sees 2 distinct signals) should be associated with each of the anode signals and therefore the sub-aperture resolution for the two events.) The maximum detection rate increases for the dual-sided parallel strip detector. Applicants describe enhanced detectors with electronically-determined interaction height resolution (sub-aperture resolution) in the pending application (p.10, lines 10-16) and in Patent No. 6,583,420 B1 (column 5, lines 40-48). Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.
6. Response to item 3, Examiner's objections to claim 7 as being anticipated by El-Hanany who discloses that the edge-on radiation detector is a pixelated array detector. In Remark 2 the Applicants note that El-Hanany does not describe an enhanced Compton gamma camera. El-Hanany does not describe electronically-determined sub-aperture resolution capability for edge-on detectors, including 2-D pixelated detectors. Applicants note that utilizing a 2-D pixelated array detector refers to a 2-D array detector that was disclosed in the pending application (p.3, lines 19-22). Applicants describe the use of enhanced 2-D pixelated array detectors in the pending application (p.10, lines 10-15). In Patent No. 6,583,420 B1 the Applicants describes the use of these 2-D (pixelated) detectors as edge-on detectors

(column 5, lines 8-16; column 6, lines 51-53). Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.

7. Response to item 3, Examiner's objections to claim 8 as being anticipated by El-Hanany who discloses that the detectors are stacked (Figure 3A). Applicants note that El-Hanany uses the words "a stack" to refer to an edge-on array of multiple, thin semiconductor crystal detectors. In Remark 1 the Applicants use the term "stacked" to refer to detectors layered on top of other detectors (see p. 36, lines 19-22 and p. 37, lines 1-2; p. 47, lines 2-14). The "stack" described by El-Hanany is shown in Applicants' Patent No. 6,583,420 B1 as Figure 1 (an array of edge-on detectors). Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.
8. Response to item 3, Examiner's objections to claim 9 as being anticipated by El-Hanany who discloses that layers of the detectors use different materials (102 is made of CdZnTe, element 118 is made of polymer). Applicants note that in El-Hanany's Figure 3A the element 118 is a PCB (printed circuit board with conductive leads) and not a detector. Applicants describe the advantages of layering multiple detector materials (p.47, lines 9-23 and p.48, lines 1-16). Applicants describe the use of multiple detector materials within a detector module or in separate detector modules in Patent No. 6,583,420 B1 (column 6, lines 48-54 and column 7, lines 49-61 and column 8, lines 9-17). Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.
9. Response to item 3, Examiner's objections to claim 10 as being anticipated by El-Hanany who discloses that gamma camera elements (elements 118, 102, 124, and 114) are all mounted and adjusted before use. Applicants specify in the pending application that detectors and modules can be adjusted by mechanical operations such as tilting (Figure 11d) (p.46, lines 22-23 and p.47, lines 1-2) or elevating (Figure 11c) (p. 48, lines 16-21). Applicants do not specify "before use" since Applicants' design represents a dynamic capability (p.7 lines 12-23 and p.8, lines 1-15). Applicants provide an identical explanation in Patent No. 6,583,420 B1 (column 4, lines 10-49). Applicants maintain that these mechanical capabilities are not related to El-Hanany's invention. Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.
10. Response to item 3, Examiner's objections to claim 15 as being anticipated by El-Hanany who discloses that the camera operates as an enhanced edge-on gamma camera. In Remark 2 the Applicants describe how the sub-aperture resolution detector capability could be used to enhance the spatial and energy resolution of edge-on gamma cameras and Compton (and PET) cameras (p. 11, lines 9-23; p. 37, lines 3-23 and p. 38, lines 1-15; p.47, lines 20-23 and p.48, lines 1-22). Applicants note that El-Hanany does not disclose enhanced Compton, PET, or gamma cameras as defined by the Applicants. In Remark 2 Applicants note that arrays of 1-D and 2-

D strip detectors, 2-D arrays, segmented strip detectors, depth-of-interaction capability, and sub-aperture resolution capability for semiconductor and scintillation detector materials for Compton, PET, and gamma camera (SPECT) imaging are disclosed in Patent No. 6,583,420 B1 (column 5, lines 8-49). Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.

11. Response to item 3, Examiner's objections to claim 16 as being anticipated by El-Hanany who discloses that the camera acts as enhanced edge-on PET detector. In Remark 2 the Applicants describe how the sub-aperture resolution detector capability could be used to enhance the spatial and energy resolution of edge-on gamma cameras and Compton (and PET) cameras (p. 11, lines 9-23; p. 37, lines 3-23 and p. 38, lines 1-15; p.47, lines 20-23 and p.48, lines 1-22). Applicants note that El-Hanany does not disclose enhanced Compton, PET, or gamma cameras as defined by the Applicants. El-Hanany describes a simple array of edge-on 2-D pixelated detectors to form a 3-D PET detector (paragraph [0020]). Applicants' enhanced Compton camera employs 1-D or 2-D detectors with electronically-determined interaction height (sub-aperture resolution) capability that can be employed in 2-D and 3-D PET gamma cameras (p. 45, lines 20-23 and p. 46, lines 1-22). Applicants' PET camera designs include both 2-D and 3-D detector modules as well as enhanced 2-D and 3-D detector modules. In Remark 2 Applicants note that arrays of 1-D and 2-D strip detectors, 2-D arrays, segmented strip detectors, depth-of-interaction capability, and sub-aperture resolution capability for semiconductor and scintillation detector materials for Compton, PET, and gamma camera (SPECT) imaging are disclosed in Patent No. 6,583,420 B1 (column 5, lines 8-49). Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.
12. Response to item 3, Examiner's objections to claims 14 and 17 as being anticipated by El-Hanany who discloses that the camera detects radiation (Figure 3A, element 112). In Remark 2 the Applicants note that El-Hanany does not describe enhanced edge-on gamma cameras or enhanced edge-on Compton gamma cameras. Applicants note that El-Hanany limits his discussion of radiation to photons (this is a detector system intended to be used primarily in PET imaging). Applicants' detector designs in the pending application can be used for photons (including simultaneous imaging of high and low energy photons), neutrons (neutral particles), and charged particles (p.36, lines 5-19; p.44, lines 17-21; p.48, lines 1-10). Applicants note that detecting multiple types of radiation with edge-on Compton, PET, and gamma camera is disclosed in Patent No. 6,583,420 B1 (column 24, lines 5-16). Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.
13. Response to item 3, Examiner's objections to claim 18 as being anticipated by El-Hanany who discloses that the camera is used for radiographic imaging (page 1, paragraph [0001]). Applicants note that El-Hanany does not describe enhanced edge-on gamma cameras in his application (see Remark 2). Applicants note that

although El-Hanany includes the term “x-ray” in paragraph [0001], the field of the invention, he does not use the term “radiographic” and he offers no explanation of how or why his edge-on 3-D semiconductor detector array would be used for x-ray (or non-x-ray) radiographic imaging. He only discusses nuclear medicine imaging. Applicants note that certain nuclear medicine isotopes are x-ray and gamma ray emitters and both can be imaged in nuclear medicine applications (p.5, lines 11-13) in the pending application. Applicants cite uses in x-ray radiography (including multiple energy imaging), CT (p. 39, lines 1-18), simultaneous x-ray radiography and nuclear medicine imaging (p. 36, lines 5-13), radiation therapy imaging and industrial radiography (p.51, lines 15-21), and non-x-ray radiography such as neutron radiography (p.32, lines 7-11) that benefit from the edge-on detector designs as well as enhanced edge-on detector designs (sub-aperture resolution and interaction depth capability). Applicants note that radiographic imaging by x-rays and particles such as neutrons using edge-on and enhanced edge-on Compton gamma cameras (and therefore PET and gamma cameras) is disclosed in Patent No. 6,583,420 B1 (column 3, lines 10-14; column 16, lines 45-56; column 24, lines 5-16). Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.

14. Response to item 3, Examiner’s objections to claim 19 as being anticipated by El-Hanany who discloses that the camera is used for radiographic imaging (page 1, paragraph [0001]), but does not specify CT radiographic imaging. Examiner states that radiographic imaging encompasses CT imaging and therefore it is inherent that El-Hanany’s invention is applicable to CT imaging. Applicants note that El-Hanany does not describe enhanced edge-on gamma cameras in his application (see Remark 2). Applicants note that although El-Hanany includes the term “x-ray” in paragraph [0001], the field of the invention, he does not use the term “radiographic” and he offers no explanation of how or why his edge-on 3-D semiconductor detector array would be used for x-ray (or non-x-ray) radiographic imaging (see Remark 13). Applicants note that certain nuclear medicine isotopes are x-ray and gamma ray emitters and both can be imaged in nuclear medicine applications (p.5, lines 11-13). El-Hanany only discusses nuclear medicine imaging. In the pending application the Applicants describe CT imaging including the use of enhanced edge-on detectors that offer sub-aperture resolution and improved energy resolution (p. 39, lines 1-18). Applicants note that radiographic CT imaging using edge-on detectors is disclosed in Patent No. 6,583,420 B1 (column 17, lines 3-4). Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.
15. Response to item 3, Examiner’s objections to claim 20 as being anticipated by El-Hanany who discloses that the camera is irradiated from the side (Figure 3A). Applicants note that El-Hanany does not describe enhanced edge-on Compton gamma cameras in his application (see Remark 2). Applicants note that El-Hanany describes radiation entering through the “sidewall”: “The stack of detectors 102 is so disposed as to receive impinging radiation 112 through the detector sidewalls 110” (paragraph [0030]). The PCB boards 108 connect the pixels to the readout

ASICs 124 located in the rear (paragraph [0032]). Applicants note that El-Hanany's edge-on detector geometry is just the conventional edge-on detector geometry for semiconductor detectors described by the Applicants in the pending application (see Figure 1 and Figure 11A) and in Patent No. 6,583,420 B1 (Figure 1) in which the readout electronics base 106 is in the rear and the radiation is incident upon the front edge or "sidewall" (to use El-Hanany's terminology). Applicants note that the edge-on side irradiation geometry described in their pending application is a non-standard implementation of edge-on imaging with semiconductor detector arrays such that the readout electronics is located at the side of the radiation entrance surface rather than in the rear of the radiation entrance surface (as shown in Figure 1). Thus the readout electronics is located parallel to the incoming radiation rather than perpendicular to it. This edge-on, side readout arrangement described for semiconductor detectors is currently the technique employed to read out edge-on scintillator detectors (see Nelson, Patent No. 4,560,882, Figures 1, 2, 3, 7, 9, 10) but not edge-on semiconductor detectors. This edge-on side irradiation geometry can be attractive for those applications in which the readout electronics should be removed from line-of-sight irradiation, a limited imaging area is acceptable, or stacking (layering) detectors (possibly of different materials, etc.) along the path of the incident radiation (potentially creating very long total path lengths within the detector) would be beneficial. With this edge-on side irradiation geometry increasing the detector total attenuation length along the direction of the incident radiation is trivial since more than one edge-on detector can be mounted along the same line versus having to layer (stack) edge-on detectors on top of other edge-on detectors (as shown in Figure 11 B of this application). Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.

16. Response to item 3, Examiner's objections to claim 21 as being anticipated by El-Hanany who discloses an edge-on radiation detector (figure 3A) wherein interaction height information or depth of interaction is used to determine sub-aperture resolution (page 4, paragraph [0034]). Applicants note that El-Hanany determines the depth position of the event (DOI) from the location of the detecting pixel within a column of pixels orientated along the Z-direction. The DOI accuracy is dependent on the anode pixel pitch in the Z-direction. El-Hanany's DOI position information and thus depth resolution is "hard-wired" (fixed) and not electronically-determined. Applicants note that this DOI capability (using 2-D detector irradiated edge-on) and sub-aperture resolution along the interaction height are described by the Applicants in Remark 2 with regard to the pending application (p. 37, lines 3-23 and p. 38, lines 1-15) and Patent No. 6,583,420 B1 (column 5, lines 8-49) for semiconductor and scintillator edge-on detectors. Furthermore, Applicants note that this DOI capability and sub-aperture resolution capability are disclosed in the Disclosure document No. 464163 (10-25-1999). El-Hanany does not describe sub-aperture resolution. The semiconductor detector designers typically use the term 'interaction depth' to refer to the location of an ionizing radiation event between the anode and cathode sides of a pixel when irradiated face-on. This interaction depth along the thickness of the pixel is determined electronically by evaluating the anode and

cathode signals. If the pixel is turned “edge-on” then the pixel thickness is now defined as the aperture height in the edge-on geometry. Electronically determining the interaction depth between anode and cathode of an event now represents the interaction height location in the edge-on detector geometry. This is what is meant by sub-aperture resolution (p. 11, lines 9-23 and p. 12, lines 1-23 and p.13, lines 1-2). Specifically, enhanced edge-on Compton, PET, and gamma (SPECT) cameras utilize interaction height or interaction depth information (p. 11, lines 20-23 and p.46, lines 6-22). This applies to edge-on and face-on detectors. Furthermore, Applicants extend the concept of aperture height information to include edge-on scintillator detectors in this application. Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.

17. Response to item 3, Examiner’s objections to claim 22 as being anticipated by El-Hanany who discloses that the radiation detector is a semiconductor detector (page 1, paragraph [0001]). Applicants note that El-Hanany does not describe the use of interaction height information to determine sub-aperture resolution (see Remark 16). Applicants note that they describe the use of semiconductor radiation detectors of various types (strip, cross strip, drift, 2-D arrays (pixelated)) in edge-on geometries in Patent No. 6,583,420 B1 (column 5, lines 8-20), the pending application, and Disclosure document No. 464163 (10-25-1999). Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.

18. Response to item 3, Examiner’s objections to claim 23 as being anticipated by El-Hanany who discloses radiation detector is a scintillator or crystal array detector (page 2, paragraph [0016]). Applicants note that El-Hanany does not describe the use of interaction height information to determine sub-aperture resolution (see Remarks 2, 16). Applicants note that El-Hanany’s crystal refers to a semiconductor crystal: “Each of the detector crystals has a two-dimensional pixelated anode array formed on one planar surface. A cathode is formed on the opposite planar surface, preferably covering the substantially all of the surface.” (paragraph [0015]). In paragraph [0018] El-Hanany refers to “electron-holes pairs... charge carriers are distributed between adjacent pixels”. These descriptions are unambiguous; the detector is a semiconductor detector. Scintillator signals are optical in nature and thus require a photodetector for conversion to an electronic signal. Applicants note that this information is disclosed in the issued Patent No. 6,583,420 B1 (column 5, lines 19-31). Applicants note that the use of edge-on scintillator detectors with sub-aperture resolution is not described by El-Hanany but is described in the pending application (p.12, lines 18-23 and p. 13, line 1-2). Further details are provided on p.41, lines 1-22 and p.42, lines 1-9. Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.

19. Response to item 6, Examiner’s objections to claims 11,12 as being unpatentable over El-Hanany in view of Nygren (US Patent 5,434,417 A). Regarding claim 11, Examiner states that El-Hanany discloses the limitations set forth in claim 10, but

not near-edge-on imaging or staggering of the detector elements. Examiner states that such a detector configuration is disclosed by Nygren (Figure 5, element 20). Examiner states that Nygren's invention in conjunction with El-Hanany's disclosure allows for convenient electrical connection between the processor and the detector. Applicants note that El-Hanany does not describe enhanced edge-on Compton gamma cameras in his application nor does Nygren (see Remark 2). Applicants' pending application claim 11 cites claim 10 and specifies near-edge-on imaging. Applicants note that claim 10 addressed detectors and modules that can be adjusted dynamically by mechanical operations such as tilting (p.46, lines 22-23 and p.47, lines 1-2) or elevating (p. 48, lines 16-21). These mechanical features are unrelated to any electronic features disclosed by El-Hanany or Nygren. Applicants show a near-edge-on detector geometry in Figure 11d (see p.15, lines 7-11; p.47, lines 1-2 ; p. 50, lines 17-23 and p. 51, lines 1-8). The detector configuration disclosed by Nygren in Figure 5 is also unrelated to the mechanical manipulation capability of tilting or elevating detectors or detector modules as described by the Applicants. Pending application claim 10 and claim 11 are not directed to allowing for convenient electrical connection between the processor and the detector. Examiner states that El-Hanany does not specify a collimator but that Nygren (Figure 55, element 66) does. Examiner states that given Nygren's invention in conjunction with El-Hanany's disclosure that it is obvious to implement a collimator with the edge-on detector. Applicants again note that El-Hanany does not describe enhanced edge-on Compton gamma cameras in his application nor does Nygren (see Remark 2). Applicants' pending application claim 12 cites claim 1 and describes a coarse Compton collimator mounted on an enhanced Compton gamma camera such that it restricts the acceptance angle of incident radiation. Applicants note that the use of this coarse collimator is counter-intuitive to the principle of a Compton gamma camera that traditionally employs no physical collimation (instead relying on 'electronic collimation' by tracking the Compton-scattered photon within the detector). This coarse collimator would not be used with a conventional gamma camera since for a conventional gamma camera (SPECT camera) the collimator holes define the maximum possible spatial resolution. The coarse collimator holes are much larger than the spatial resolution of the camera. The collimator is much lighter (p.49, lines 1-23 and p.50, lines 1-5) than a conventional gamma camera collimator and it limits radiation reaching the detector from extreme angles which are likely to be the most difficult to analyze. Thus the rate of detection for good candidate photons should increase. The coarse collimator is not being used to reduce detected scatter radiation which is the purpose of a x-ray radiographic collimator. Whether a photon was scattered prior to reaching the detector can be determined by measuring the deposited energy in a Compton gamma camera. Applicants contend that claim 1 is valid. The collimator disclosed by Nygren in Figure 5 is just an ordinary x-ray radiographic (anti-scatter) collimator and would obviate a major advantage (a large acceptance aperture) of a Compton camera since it would require very narrow acceptance angle (nearly perpendicular to the entrance face of the detector) for each of the collimator holes. Coarse collimator holes ensure that the acceptance angle for the Compton camera remains significantly larger than for a gamma camera with standard collimator while avoiding the drawback that

positioning errors become problematic for Compton cameras when radiation is incident at very large acceptance angles. The course Compton collimator would not be useful if deployed with a conventional gamma camera or for radiographic x-ray imaging. The use of conventional and unconventional radiation collimators for x-ray and gamma ray imaging in nuclear medicine is addressed in Patent No. 6,583,420 B1 (column 5, lines 27-37). Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.

20. Response to item 7, Examiner's objections to claim 6 as being unpatentable over El-Hanany in view of Lingren (US Patent 6,046,454 A). Examiner states that El-Hanany discloses the limitations set forth in claim 1 while Lingren discloses a dual-sided cross strip detector (Figure 15A). Examiner states that the combination of the detector disclosed by Lingren with the invention disclosed by El-Hanany would be used to increase the accuracy of determining the position of the detected radiation. Applicants note that in the SUMMARY section Lingren states "In implementing a semiconductor radiation detector that follows this principle, the invention employs a detector structure having a novel arrangement of three electrodes that virtually eliminates tailing while maintaining high collection efficiency." (column 5, lines 28-32). Although Lingren discloses a lower-noise (eliminates tailing) 2-D detector design he does not disclose a 2-D detector with electronically-determined aperture height resolution (sub-aperture resolution) capability (a single 2-D detector that functions as a 3-D detector). Applicants contend that claim 1 is valid (see Remark 2). Applicants contend that El-Hanany does not describe an enhanced Compton gamma camera or detectors with sub-aperture resolution capability (which Applicants define on page 11, lines 9-23 of the current application). The Applicants disclose (see Remark 16) the use of arrays of edge-on, semiconductor (or scintillator) 1-D detectors and 2-D detectors (to provide depth-of-interaction resolution). The use of electronically-determined interaction height information for semiconductor detectors was disclosed by the Applicants in Patent No. 6,583,420 B1 (column 5, lines 8-49) and the Disclosure document No. 464163 (10-25-1999). Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.
21. Response to item 8, Examiner's objection to claim 13 as being unpatentable over El-Hanany in view of Nygren and Pfoh (US Patent 5,400,379 A). Examiner states Nygren discloses the limitations set forth in claim 12, but does not specify a shield for covering specific radiation detectors. Examiner states that Pfoh discloses a mask or shield (Figure 4B, element 60) that selectively covers the detector elements (column 3, lines 50-61). Applicants note that Claim 13 refers to a particular coarse Compton collimator wherein a radiation shield covers specific edge-on radiation detectors of an enhanced Compton gamma camera. Applicants maintain that claim 12 is valid (see Remark 19). El-Hanany never expresses the need to include a collimator with a Compton camera (or an enhanced Compton camera) and Nygren's x-ray radiography collimator is used to diminish scattered x-ray radiation. Pfoh describes a collimator useful for increasing the effective number of CT scanner detector rings (related to the spatial resolution along the axis of the CT "cylinder")

without actually increasing the number of actual detector rings. This is achieved by moving the collimator along the axis of the cylinder such that (for example) ½ of each detector element in a ring is exposed (representing the apparent ring designated as "one"). Next the collimator moves ½ pixel forward and the second half each detector element in a ring is illuminated (representing the apparent ring designated as "two"). Thus this is a dynamic radiographic collimator with the limitation that adjacent rows of pixels cannot be irradiated directly at the same time. Applicants disclose a fixed radiation shield that covers specific edge-on detectors within an enhanced Compton camera (p.15, lines 1-6 and p.49, lines 1-17) as shown in Figure 11c. While the shield is intended to prevent direct irradiation of a detector or detector module, the detector or detector module with the shield still functions as an active, independent, enhanced edge-on detector which will preferentially receive Compton-scattered radiation from adjacent edge-on detectors that intercept the incident radiation. The shield allows a particular edge-on detector to detect Compton scatter radiation with minimal "noise" from direct radiation. Thus, this coarse Compton collimator is not used to selectively define spatial resolution, which is the function of the Pfoh CT radiographic collimator. Applicants contend that the coarse Compton collimator is functionally distinct from the radiographic CT collimator disclosed by Pfoh and would not be useful for CT imaging. Since it blocks incident radiation (whether scattered or not scattered) from reaching entire sections (containing multiple adjacent detector elements) of the entrance surface of the detector it does not function in the manner of a x-ray radiographic collimator as described by Nygren or Pfoh. Applicants claim priority based on the filing date of Patent No. 6,583,420 B1 and abandoned CIP Application No. 10/462,191.

CONCLUSION

Applicants respectfully submit that they have addressed the Examiner's objections. Applicants respectfully request that the Examiner reconsider and withdraw the outstanding rejections and allow the present application. Applicants invite the Examiner to telephone the undersigned representative if the Examiner believes that a telephonic interview would help advance this case to allowance.

Respectfully submitted,

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